WHAT IS CLAIMED IS:

1. A radiation detector array, comprising:

a plurality of radiation detector modules, wherein each module comprises:

at least one radiation detector,

a communication link for transferring data between the module and a computer system.

2. The array of Claim 1 further comprising:

a collimator mounted on each detector whereby the collimator is positioned on a surface of the detector facing a radiation source, the collimator being capable of optimizing radiation detection by the detector.

3. The array of Claim 2 wherein the detector is a detector chosen from the group consisting of a linear array semiconductor detector, a small, two dimensional semiconductor detector, an edge-on semiconductor detector, and an edge-on scintillator detector.

4. The array of Claim 2 further comprising:

a radiation shield surrounding the array, wherein the shield is designed to reduce erroneous detection of incident radiation by the array.

5. The array of Claim 2 further comprising:

tracks in operable connection with the modules that facilitate movement of the modules along the tracks, wherein the tracks are configured in a geometry chosen from the group consisting of a cylindrical geometry, a spherical geometry, and a contoured geometry.

6. The array of Claim 5 wherein the modules are capable of moving along the tracks independently of other modules in the array..

7. The array of Claim 2 further comprising:

flexible tracks in operable connection with the modules that facilitate movement of the modules along the tracks in a manner whereby the modules conform to an area of a patient being monitored.

8. The array of Claim 2 wherein the collimator is configured for increased apparent aperture of the module, for spectral filtering, and for decreased detection of scattered photons, the collimator being one chosen from the group consisting of an unfocused capillary collimator and a minifying capillary collimator.

9. The array of Claim 2 wherein the collimator is a Compton scatter module collimator.

10. The array of Claim 2 further comprising a configurable x-ray optics subsystem capable of functioning as a narrow bandwidth filter, a focusing device, and a directional filter to enhance the collimator performance.

11. The array of Claim 10 wherein the x-ray optics subsystem comprises a plurality of nested refractive lenses configured to produce multiple focused beams wherein each beam is directed to a corresponding detector module.

12. The array of Claim 10 wherein the x-ray optics subsystem is a subsystem chosen from the group consisting of an x-ray mirror and an array of micromirrors.

13. The array of Claim 10 wherein the x-ray optics subsystem comprises:

a first refractive lens component, comprising a plurality of refractive slats attached to a support structure, wherein the slats are configured to refract radiation towards a focal point on the module, and

a second refractive lens component, comprising a plurality of refractive slats attached to a support structure, wherein the slats are configured to refract radiation towards a focal point on the module,

wherein the first refractive lens component and the second refractive lens component are oriented so that the plurality of refractive slats of the first component faces the plurality of refractive slats of the second component.

14. The array of Claim 13 wherein the first and second refractive lens components are nested.

15. A wearable radiation detector array comprising:

a shell capable of accepting and holding a detector array, wherein the shell is shaped in a configuration wearable by a patient, and

a detector array incorporated into the shell comprised of a plurality of detector modules.

16. The wearable array of Claim 15 further comprising:

an open frame structure incorporated into the shell configured to accept and support the array, wherein the open frame subsystem allows for varied configurations of the modules within the array.

17. The wearable array of Claim 15 wherein the array further comprises:

a plurality of collimators associated with each module, wherein the collimators are capable of optimizing imaging of the patient.

18. The wearable array of Claim 15 wherein the shell is configured in a shape chosen from the group consisting of a vest, a helmet, a brassiere, a neck brace, a girdle, and a belt.

19. An incident radiation detection system, comprising:

a radiation detector array, wherein the array comprises a plurality of radiation detector modules,

a mechanical positioning subsystem capable of aligning the modules within the array to optimally detect incident radiation,

a monitoring subsystem to control operating parameters of the array and processing detected radiation data from the array prior to transmitting said data to a computer subsystem, and

a computer subsystem to analyze the array parameters and detected radiation data, wherein the computer subsystem is further capable of processing the detected radiation data for image reconstruction and material analysis purposes.

20. The incident radiation detection system of Claim 19 wherein the positioning subsystem comprises:

a plurality of actuator arms, wherein a module is mounted on an arm, the arm thereby configured to move each module independently of the entire array.

21. The incident radiation detection system of Claim 19 wherein the arrays are configured in a standard geometry or a contoured geometry.

22. The system of Claim 19 wherein the modules are adaptively positioned according to data obtained by analyzing the module parameter information and the detected radiation data.

23. The system of Claim 19 wherein the array further comprises a plurality of collimators, each collimator attached to a surface of a module that is oriented to face an incident radiation source.

24. The system of Claim 23 wherein the collimators are capable of being adaptively controlled.

25. The array of Claim 19 further comprising:

sensors capable of restricting speed of motion of the array and proximity of the array to a subject, wherein the sensors are selected from the group consisting of motion sensors, optical range sensors, acoustic range sensors, and pressure sensors.

26. An electronically configurable collimator system, comprising:

a first set of adjustable slats,

a second set of adjustable slats, and

a support frame designed to secure the first and second set of adjustable slats, wherein the first set of adjustable slats is positioned along the support frame in an orientation corresponding to a long edge of a detector module, and the second set of adjustable slats is positioned along the support frame in an orientation corresponding to a short edge of a detector module.

27. The collimator system of Claim 26 wherein the first and second sets of slats are capable of adjustment independently of each other.

28. The collimator system of Claim 26 wherein the first set of adjustable slats is divided into subdivisions, each subdivision corresponding to a detector, and wherein each subdivision is capable of being manipulated independently of other subdivisions.

29. The collimator system of Claim 26 wherein the second set of adjustable slats is divided into subdivisions, each subdivision corresponding to a detector, and wherein each subdivision is capable of being manipulated independently of other subdivisions.

30. The collimator system of Claim 26 wherein the first and second sets of adjustable slates are both subdivided such that each subdivision is capable of being manipulated independently of other subdivisions.

31. The collimator system of Claim 26 further comprising:

a manipulation subsystem capable of adjusting the adjustable slats comprising manipulation devices taken from the group consisting of actuators, miniature motors, pulley mechanisms, electro-mechanical biopolymer actuators, piezo-drivers, micromachines, and screw drives.

32. The collimator system of Claim 26 wherein the first and second set of adjustable slats are made of material chosen from the group consisting of photon attenuating material, reflective material, diffractive material, and refractive material.

33. An x-ray radiographic imaging system, comprising:

a rotatable gantry including an adjustable arm, wherein the arm is configured to hold an x-ray tube and an x-ray detector module,

an x-ray tube positioned on the arm of the gantry, wherein the tube comprises:

a radiation source, and

an x-ray optics subsystem designed to focus the radiation source, wherein the subsystem is chosen from the group consisting of a capillary x-ray lens, a diffractive x-ray structure, and an x-ray mirror, and

an x-ray detector module positioned on the gantry and aligned with the tube.

34. The imaging system of Claim 33 further comprising:

at least one compression plate for positioning a breast of a subject, wherein the at least one plate is located between the x-ray tube and the x-ray detector module.

35. The imaging system of Claim 34 wherein at least one of the compression plates is contoured.

36. The imaging system of Claim 34 wherein at least one of the compression plates has an open region located adjacent to the breast.

37. The imaging system of Claim 34 further comprising:

a first configurable x-ray mirror designed for spectral and directional filtering of radiation, wherein the mirror is positioned between the x-ray tube and the compression plates.

38. The imaging system of Claim 37 further comprising:

a second configurable x-ray mirror designed for additional spectral and directional filtering of radiation after the first mirror had filtered the radiation, wherein the second mirror is positioned between the compression plates and the x-ray detector module.

39. The imaging system of Claim 34 further comprising:

a first collimator placed between the x-ray tube and the compression plates, and

a second collimator placed between the compression plates and the x-ray detector module,

wherein the first and second collimators moderate the radiation that is passed through the subject breast, and the first and second collimators further concentrate the radiation into a narrowed geometry.

40. The imaging system of Claim 33 further comprising:

a second rotatable gantry that includes an adjustable arm configured to hold an x-ray tube and an x-ray detector module, wherein the second gantry is positioned parallel to the first gantry, and wherein the second gantry is positioned an adjustable distance from the first gantry, the distance being adjustable for scanning objects of different sizes,

an x-ray tube positioned on the arm of the second gantry, wherein the tube comprises:

a radiation source, and

an x-ray optics subsystem designed to focus the radiation source, wherein the subsystem is chosen from the group consisting of a capillary x-ray lens, a diffractive x-ray structure, and an x-ray mirror, and

an x-ray detector module positioned on the arm of the second gantry, wherein the module is aligned with the tube, and the module is further capable of detecting focused radiation emanating from the tube,

41. An x-ray optic system for generating focused radiation, comprising:

a plurality of radiation sources sources capable of generating radiation,

an anode subsystem comprised of a plurality of elements configured to enable a selection of a specific anode spectrum, and

a plurality of capillary x-ray lenses, aligned with the plurality of radiation sources, for focusing the radiation.

42. The optic system of Claim 41 wherein the anode is a composite anode.

43. The optic system of Claim 41 wherein the plurality of anode subsystem elements is comprised of a first set of molybdenum disks and a second set of rhodium disks, wherein the first set of molybdenum disks and the second set of rhodium disks are

positioned in an alternating fashion with a molybdenum disk alternating with a rhodium disk.

44. The optic system of Claim 41 wherein the plurality of anode subsystem elements comprises:

a first semicircular cylinder of a first material, and

a second semicircular cylinder of a second material, wherein the first and second cylinders positioned in operative contact to form a complete, circular cylinder and the materials.

45. The optic system of Claim 44 wherein the first material is molybdenum and the second material is rhodium.

46. The optic system of Claim 41 wherein the plurality of anode subsystem elements is comprised of a plurality of full-sized anode cylinders of different materials, the full-sized cylinders being configured to enable shifting of a cylinder such that only one cylinder at any one time filters the radiation.

47. The optic system of Claim 46 wherein the cylinders are configured end to end by abutting the cylinders.

48. An x-ray optic system designed to generate a slit-like radiation beam, comprising:

a dense array of radiation sources for generating a radiation beam, and

a wedge-shaped capillary x-ray optic lens aligned with the radiation sources for focusing the beam into a slit-like shape.

49. A method for improved mammography radiographic imaging comprising:

providing a radiation source that is directed towards a subject breast,

providing a radiation detector apparatus to measure incident radiation from the breast,

measuring successive, overlapping subimages of the breast, and

constructing a mammography image by forming a continuous image of the breast using the successive, overlapping subimages.

50. The method of Claim 49 further comprising:

compressing individual sections of the breast,

measuring each individual section non-concurrently, and

enhancing the entire image of the breast by supplementing the entire image with the individual, non-concurrent measurements.

51. A method for dynamically acquiring an optimized mammography image comprising:

acquiring x-ray statistics on an area to be imaged,

determining suitable x-ray beam parameters for the area to be imaged by analyzing the x-ray statistics, and

adjusting an x-ray beam according to the determined parameters.

52. The method of Claim 51 wherein a first scan performs the acquiring x-ray statistics step and further comprising:

imaging the area using a second scan to form the optimized image.

53. A method for tuning a radiation detection apparatus by estimating the effects of tissue attenuation, comprising:

introducing at least one reference source into a subject, wherein the source exhibits a known shape, size, composition, activity distribution, and photon energy spectrum,

measuring radiation scattering effects of tissue positioned between the source and a radiation detection apparatus, said measuring occurring when the source is at a desired location,

measuring radiation absorption effects of tissue positioned between the source and the radiation detection apparatus, said measuring occurring when the source is at a desired location, and

tuning the radiation detection apparatus based upon the measured scattering effects and the measured absorption effects.

54. The method of Claim 53 wherein the source expresses at least one additional property selected from the group consisting of magnetic, acoustic, inductive,

and x-ray attenuating, said detection apparatus further capable of measuring the additional property.

55. The method of Claim 53 further comprising:

calibrating a detector array based upon the measured radiation scattering effects and the measured radiation absorption effects, wherein the calibrating enables dynamic, adaptive imaging; and

focusing the detector array at an approximate location of a radionuclide distribution based upon the calibrating.

56. The method of Claim 53 further comprising:

measuring an energy-dependent modulation transfer function of the detection apparatus.

57. A method of calibrating a radiation detection system comprising:

providing a known radiation source distribution that emits radiation, wherein the source is chosen from the group consisting of a uniform point-like source, a line-like source, a spherical source, a rod-like source, a collimated spot source, a slit source, a slot source, a grid pattern source, a planar flood field, and a shaped three-dimensional flood field,

measuring the level of radiation emitted from the source that is detected by the detection system, and

calibrating the detection system by evaluating the detected radiation and balancing the system based upon the detected radiation.

58. The method of Claim 57 further comprising:

measuring an energy-dependent modulation transfer function of the detection system, and

calibrating the system by accounting for both the detected radiation and the energy-dependent modulation transfer function.

59. A method of estimating the effects of tissue attenuation on the intensity and energy distribution of a x-ray beam comprising:

calibrating an energy-resolving detector array by determining its energy-dependent modulator transfer function,

aligning the calibrated energy-resolving detector array with the x-ray beam,

measuring a first position-dependent, energy-dependent intensity profile of the x-ray beam at the detector array,

transmitting the beam through a patient,

measuring a second position-dependent, energy-dependent intensity profile of the x-ray beam at the detector array immediately after the beam has been transmitted through the patient, and

comparing the first and the second position-dependent, energy-dependent intensity profiles of the beam.